PART III

SURFACE WATER ASSESSMENT

This part of the water quality assessment report discusses the condition of the various waterbodies (i.e. the rivers and streams, coastal shorelines, etc.). The entire monitoring program is examined from strategies and procedures to data assessment. The majority of the information used in this section was gathered mainly from the Clean Water Branch. Other sources contributing information include the Department of Land and Natural Resources, the Environmental Planning Office and the Epidemiology Branch.

CHAPTER ONE

SURFACE WATER MONITORING PROGRAM

Almost all of the existing problems in meeting potable water quality standards are associated with surface water sources. However, none of the problems are attributable to direct discharge. While mainland states have used their rivers and streams for both wastewater discharge and as sources of drinking water, requiring massive and expensive clean-up efforts, the limited amount of industrial development in Hawaii has grown up adjacent to or near the shoreline and coastal harbors. Wastewater has been discharged into coastal waters rather than streams. In the unusual instance where discharges enter streams, they are well downstream of water intake pipes.

For these reasons, the failure of surface water to meet water quality standards is generally attributable to natural causes, such as excessive organic material and soil particles, or from diffuse or nonpoint sources of pollution such as agricultural runoff. Since these are the kinds of problems that are extremely difficult to prevent, the preferred solution is to replace surface water sources with ground water sources wherever possible. The programs to control the various activities that cause or contribute to surface water pollution are described further in Part IV of this report.

The surface water monitoring program of the Department of Health is confined to estuary and coastal waters. No streams used for drinking water are monitored on a regular basis.

With budget cutbacks again impacting the monitoring program in both 1995 and 1996, the emphasis has been on what sampling to eliminate rather than what areas to expand coverage to. The implementation of the watershed approach resulted in a commitment to a pilot project in the Ala Wai Watershed. This required the diversion of significant sampling resources from the more heavily used coastal shoreline areas to the far more lightly used watershed. A couple of interesting trends in nutrient and bacteria levels emerged, but their investigation will have to wait until more resources become available.

DOH is currently working on a Quality Assurance Project Plan, but it will not be completed before the issuance of this report.

MONITORING STRATEGY OVERVIEW

The long term goal is to assess all inland, wetland and coastal waters identified by the 303(d) listing process as priority waterbodies in the State. The overall coverage and design will encompass a space-time framework of regional and specific geographic sites of selected coastal and inland waterbodies, including entire watersheds, e.g., the Ala Wai Watershed Project. Due to the large number of candidate sites, the duration of monitoring at selected sites is planned on a 2-year rotational basis.

Water quality assessments will be coordinated with other watershed planning and support activities, in addition to compliance and enforcement activities, status and trend assessment and other monitoring needs. The overall objective of the monitoring design is to integrate a combination of data and information to serve both regional and site-specific information needs, specifically on targeted waterbodies of the CWA §303(d) List, §319 Nonpoint Source Assessment and §304(l) Toxic Substance List.

Water quality monitoring at benchmark sites or fixed

stations will produce ambient water quality data for regional assessments describing status and trends to characterize changes over time. In contrast, site-specific targeted stations will determine sources or patterns of contamination and characterize spatial and temporal factors affecting water quality. The monitoring projects may include intensive surveys, probability sampling for contamination patterns, systematic sampling, or stratified random sampling networks.

The extent to which data collection and methods are used will depend on preliminary assessments and review of existing water quality for a specific waterbody and watershed. The initial monitoring review will determine the usefulness of existing data, adequacy of data/information, and the need for additional monitoring or special surveys. The screening method will consider other data needs such as sediment load, hydrology, biological/ecological habitat, climate, biological markers, chemical (water column and bottom sediments), fish tissue contaminants and land-use practices.

The wide range of available data from various sources will be used as part of a regional data collection and methods goal. The monitoring program will have permit-related monitoring data to fill data gaps where fixed monitoring stations are lacking or to supplement the present database. Construction and development projects with permit-related storm water monitoring requirements will be entered into the State/EPA STORET system for data processing, managing and retrieval. Government agencies and others also produce useful data that will be part of the data collation and methods goal. These sources include the U.S. Army Corps of Engineers, USGS, U.S. Fish & Wildlife Service, USDA Resource Conservation & Development, City & County of Honolulu, the University of Hawaii and private consultants.

In addition, the data will be used to identify and prioritize prevention and control measures for best management practices, in setting new regulations, as well as in compliance and enforcement activities.

Environmental indicator goals will serve as a guide to the monitoring program by identifying specific indicators in three broad areas: (1) Nonpoint Source Pollution and (2) Human Health, and (3) Water Quality. Recorded physical observations in combination with various water-specific indicators, e.g., suspended solids, turbidity, sediment toxicity, fish tissue contaminants, stream alteration, flow diversion, and habitat modification, will be used in quantifying and addressing harmful or critical effects.

With increasing use and interface with GIS, the database in the EPA's STORET and Waterbody System will remain as the primary source of data and information. Waterbody assessments will utilize the most current data and information from this system. The end-users of the database systems include not only government agencies but consultants, students and the general public.

A survey method known as the Hawaii Stream Bioassessment Index (HSBI) provides a single semi-quantitative numerical value that measures the biological integrity of streams. The HSBI is a monitoring tool used to assess biological assemblages and stream habitat. Due to the limited resources, the program will initially evaluate the stressors that are directly linked to land use activities of the watershed. The land use impact on streams will be measured with respect to substrate characteristics, embeddedness, deposition of fine sediments, stream bank stability and riparian zone, utilizing the assessment protocols established in the HSBI. The biological assessment component of the HSBI will be utilized to the extent necessary and appropriate in establishing reference conditions.

As with other volunteer monitoring programs throughout the nation, the public sector contributions provide invaluable service not only to the communities but to government as well. In Hawaii, the monitoring program has benefited from the Kailua/Waimanalo Volunteer Monitoring Projects and the Department of Education Ala Wai Canal watershed monitoring. To a large extent the projects are currently part of the learning experience in which the participants hope to develop a model for other

volunteer groups and communities elsewhere.

Collaboration between the Department of Health and other state and federal agencies, including private consulting firms, is another key component of the monitoring program. The permit requirements such as CWA §401 stipulate water quality monitoring by permit applicants. It provides a source of data from which the State's monitoring program also benefits. Water quality data generated by the permits result in greater Statewide coverage and comprehensive assessments at no increase in cost to the program. The coordination between multiple agencies and permit applicants also provides for expediting the permit process through early plan reviews and dialogues in preconstruction meetings.

NETWORKS AND PROGRAMS

FIXED STATION NETWORKS:
CWB continues to maintain its network of ambient monitoring stations. These stations are listed in Appendix C. The number of stations has been reduced in the past several years, as has the sampling frequencies. New program requirements also had a major impact as well, as the pilot watershed project in the Ala Wai Watershed absorbed nearly 20% of the allocation for chemistry samples.

MICROBIOLOGICAL SAMPLING
Purpose:
The bacteriological monitoring program focuses mainly on the shoreline waters throughout the state for the purpose of assuring the safety of the swimmers, surfers, divers and other recreational users of the nearshore waters.

Objectives:
The bacteriological monitoring program serves two purposes. First, it identifies those areas where there is a potential for health related risks associated with the recreational use of shoreline waters. Secondly, monitoring provides an on going baseline from which to establish trends in the future, and from which to determine if additional sample results show unusual or abnormal levels.

Number of Sites:
As of September 1997, the bacteriological monitoring program was sampling at approximately 153 stations throughout the state.

Sampling Methods:
Where possible, the Department of Health follows standardized procedures for the collection of water samples. An example of this is the procedure for the collection of *Enterococcus* samples which is detailed in the "Standard Methods for the Examination of Water and Wastewater, 19th edition." Further, the Clean Water Branch has established in-house procedures for the collection of bacteriological samples, as well as instrument operating procedures for the various pieces of sampling equipment.

Sampling Frequency:
On Oahu, shoreline sites are sampled on a weekly or biweekly basis. On the neighbor islands, the majority of the sites are sampled on a monthly basis with the remainder being sampled bi-weekly.

Parameters:
The water samples are analyzed for *Enterococcus* bacteria, the most widely accepted indicator organisms for contamination of recreational surface waters and *Clostridia Perfringens*. CWB no longer tests for *Fecal Coliform* (cost saving measure).

CHEMICAL SAMPLING
Purpose:
Because nonpoint source pollution is the largest cause of impairment to the nearshore waters, the chemistry monitoring program focuses on these waters to measure and monitor the impacts of runoff, and to identify trends and possible corrective actions.

Objectives:
The purpose of the chemical monitoring program is to provide data and information on ambient water quality characteristics for determining compliance with the State's water quality standards.

Design Methodology:
Most of these stations correspond with the sites where bacteria samples are taken, however, additionally, several offshore sites are also sampled in areas where the water quality may be impacted by manmade discharges (Mamala Bay, Pokai Bay) or where we wish to monitor a fragile environment (Kaneohe Bay).

Number of Sites:
Until November 1997, chemical monitoring was conducted at approximately 66 separate stations throughout the state. Sampling was then suspended while the laboratory began setting up a new spectrophotometer.

The spectrophotometer is the first major upgrade to the laboratory's equipment in many years and should now enable them to obtain results similar to other laboratories.

Sampling Methods:
Some parameters are measured in the field. The remainder require taking samples and returning them to the laboratory for analysis. Samples are taken following written, established procedures which are based as much as practicable on the practices as stated in references such as "Standard Methods for the Examination of Water and Wastewater, 19th edition".

Sampling Frequency:
Similar to the bacteriological monitoring program, chemistry samples are taken at fixed monitoring stations on a monthly basis.

Parameters:
Samples are analyzed for temperature, salinity, dissolved oxygen, turbidity, ammonia nitrogen, nitrate and nitrite nitrogen, Kjeldahl nitrogen, total nitrogen, total phosphorus, pH, total suspended solids, secchi disc, orthophosphate phosphorus, and chlorophyll a.

OTHER MONITORING PROGRAMS
(Intensive surveys, probability based surveys, toxics monitoring, biological monitoring, fish tissue, sediment and shellfish monitoring)

CWB conducted these types of monitoring in the past and would like to resume the programs, but it is not possible given the current fiscal problems. None of these types of monitoring was conducted during this reporting cycle.

The only facilities required by their permit to monitor for toxics are the electrical power generating plants (to verify that no residuals from their wash water are discharged) and the municipal sewage treatment plants (all priority pollutants). However, this sampling pertains mainly to the effluent being discharged, not the ambient waters where the discharge occurs.

LABORATORY ANALYTICAL SUPPORT

LABORATORIES USED

The Department of Health has a Laboratory Division which is responsible for the analysis of the samples collected by DOH personnel. The two basic types of samples, microbiological and chemical, are each handled by separate sections within the Chemistry Branch of the Laboratory Division.

The Microbiology and Chemistry Sections were separate branches within the Laboratory Division at one time, but when the Microbiology Branch supervisor retired, the position was abolished and the Branch was reduced to a section and placed under the Chemistry Branch.

In the past, DOH had also utilized the services of the Natural Energy Laboratory of Hawaii (NELH), however, budget cutbacks resulted in the termination of the contract. This translated into a loss of 50% of the chemistry program's sampling capacity, and the microbiology sampling for West Hawaii.

Each of the four largest islands, Kauai, Oahu, Maui and Hawaii, has its own microbiology laboratory which conducts the analysis for their respective islands. Only the Oahu laboratory is currently capable of conducting chemical analyses.

QUALITY ASSURANCE/QUALITY

The quality assurance/quality control program plan is still in the process of being finalized. Interested parties should

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contact the Environmental Planning Office for this document after it is officially issued.

DATA STORAGE, MANAGEMENT AND SHARING

All of the sampling data obtained from the Clean Water Branch's fixed network of routine monitoring stations has been entered into EPA's STORET system. The data is entered into STORET via the DATASTOR program created specifically for this purpose by the EPA Region IX Storet coordinator. DATASTOR is one of several programs which were created to allow for personal computer to mainframe communication. This program allows the Clean Water Branch to enter data and make corrections on the personal computer, and then batch the entire file to the mainframe, thereby requiring only a fraction of the on-line time which would otherwise be necessary to enter the data. The mainframe system itself is maintained by EPA and the data is managed by the Clean Water Branch with the assistance of the EPA Region IX Storet coordinator. In addition, some of the results of previous intensive surveys are also kept in the STORET system. By utilizing STORET, the data is readily available to anyone who has access to the system. The Clean Water Branch also handles numerous requests for data from students, administrators, teachers, private citizens, consultants and many others, and freely shares its data with all of them.

Permittee effluent monitoring also generates a significant amount of sampling data. However, the data is only on hard copy, not electronic form. Although the data is accessible, it must be gathered and then compiled by hand before someone can begin to analyze it. Hence, only those involved with or concerned about a specific location normally reviews this type of information. CWB staff would like to have this data available as an additional source of information (especially in areas where no other sampling may exist), however, other responsibilities have higher priority (e.g. WBS assessments and the 305(b) report), and therefore, no progress can be made in this data.

TRAINING AND

DOH had helped to establish volunteer monitoring groups

SUPPORT FOR VOLUNTEER MONITORING

in the Waimanalo and Kailua areas, however, due to internal problems, both groups are no longer functional.

The Kailua Bay Advisory Council is currently actively seeking to reestablish a volunteer monitoring group. A coordinator has been hired, and preliminary groundwork has begun. The project is still in the early planning stage.

CWB has also been assisting the North Shore Public Interest Research Group (NSPIRG) in the education of the North Shore residents of the water quality in the area. CWB has been providing the results of its sampling in the North Shore area to NSPIRG. The information is then incorporated onto posters and posted in several public areas along the North Shore. NSPIRG has reported favorable responses from the local residents. (See the next two pages for examples of the posters.)

DATA INTERPRETATION AND COMMUNICATION

Status of the WBS System:
CWB has been using the WBS program exclusively to store its assessment data. Technical support has been provided by an EPA contractor based in North Carolina. Use of the program has proved challenging since it's inception and the current revision is no exception. Comments relative to this cycle are listed in Appendix D.

It is expected that the quality of the data will improve with each new cycle, becoming more comprehensive at the same time.

Status of Georeferencing Waterbodies to WBS:
While CWB maintains the WBS database, it does not possess the technical expertise to link WBS to the Geographic Information Systems (GIS). CWB has been dependent on EPO for all GIS related information. However, this capability is slowly being developed and georeferencing will be incorporated as CWB further improves its GIS proficiency.

Efforts to Make Reports Accessible:
The long term goal is to have all assessment information available (e.g. via the Internet.) The current information is of limited use, but is available to all interested parties either through the 305(b) Report or CWB. It is expected that progress will be made in accessibility with each new cycle.

PROGRAM EVALUATION

The draft of the Quality Assurance Project Plan is currently being revised. The final version is not expected to be issued until after the completion of this report. Interested parties should contact the Environmental Planning Office for this document.

MISCELLANEOUS

MAPS OF FIXED STATION MONITORING SITES
Maps of the fixed station monitoring sites are included in Appendix C along with the list of monitoring sites.

EPA's ENVIRONMENTAL MONITORING AND ASSESSMENT PROGRAM (EMAP)
DOH did not use the data from EPA's EMAP program in

its assessments of its waterbodies during this reporting cycle, and does not foresee the applicability of this data to its assessments in the future. Consequently, use of the data is not anticipated.

The EMAP Program checks water clarity and marine debris at each of approximately 600 sampling locations in the Virginian and Louisianian Provinces.

USGS's NAWQA and NASQAN:
DOH did not utilize any information from either of the USGS's programs, NAWQA or NASQAN, during this reporting cycle. DOH may use the information in the future as the data becomes available. These programs are summarized below.

NAWQA
The National Water-Quality Assessment (NAWQA) Program is designed to describe the status and trends in the quality of the Nation's ground- and surface-water resources and to provide a sound understanding of the natural and human factors that affect the quality of these resources. As part of the program, investigations will be conducted in 59 areas-- called "study units"-- throughout the Nation to provide a framework for national and regional water-quality assessment. Regional and national synthesis of information from study units will consist of comparative studies of specific water-quality issues using nationally consistent information. National Water-Quality Assessment (NAWQA) Study Units--Water Quality Information for Specific Locations

NASQAN
Water-resource planning and water-quality assessment require a nationwide base of information. To obtain this information, the chemical and physical quality of surface water and ground water must be defined and monitored. In addition, long-term sampling stations representing the numerous hydrological accounting units in Michigan must be operated to meet the objectives of the National Stream Quality Accounting Network (NASQAN).

NOAA's Status and Trends:
DOH did not utilize information from NOAA's Status and Trends program during this reporting cycle, but may in the future as applicable.

Since 1984, the National Status and Trends (NS&T) Program has monitored, on a national scale, spatial and temporal trends of chemical contamination and biological responses to that contamination. Temporal trends are being monitored through the Mussel Watch project that analyzes mussels and oysters collected annually at about 200 of those sites. Spatial trends have been described on a national scale from chemical concentrations measured in surface sediments collected by both the Mussel Watch and Benthic Surveillance Projects from 240 sites distributed throughout the coastal and estuarine United States. The Benthic Surveillance Project has, in addition, measured chemical concentrations in fish livers and performed histological analyses of fish for evidence of biological responses to chemical contamination.

MONITORING/DATA MANAGEMENT TOOLS NEEDED

DOH has previously cited the need for a more accurate indicator organism with which to assess the quality of waters. The current indicator organism, *Entercoccus*, has value in assessing the health risks of contact with sewage contaminated waters, however, in daily practice, constant interference from nonpoint sources have diminished the effectiveness of *Enterococcus* as an indicator. This has helped to fuel the public perception that use of the recreational waters could result in negative health effects when it actually may not be true. (See Appendix E for a study of Laie Bay waters by Thomas Hemingway. This study was conducted without the knowledge that DOH also monitors these waters. His conclusion that swimming in these waters increases health risks when discharges are present overlooks the prerequisite for sewage contamination.)

An organism which can correlate to negative health effects and be independent of interference from other sources such as nonpoint source pollution would be a much more

reliable tool upon which to base management decisions.

A study of the health effects from nonpoint source pollution was conducted by the Santa Monica Bay Restoration Project, but that study stated that "... Sewage spills and hydraulic overload following rainstorms occur intermittently and may lead to discharge of primary-treated sewage and floatables such as tampon applicators into storm drains (NRDC, 1991); leaky sewer lines, illegal sewer connections, blocked sewer overflows, leaky septic tanks and local direct human sources (such as the transient population and illegal dumping of recreational vehicles) may also contribute human waste to storm drains emptying into the bay (SMBRP, 1990, 1992). ...". Locally, a similar epidemiological study of the Kuhio Beach waters revealed no correlation between the levels of *Enterococcus* from storm water runoff and health risks to bathers.

DOH has sponsored the Water Resources Research Center (WRRC) in an effort to clarify this issue. WRRC has responded by identifying *Clostridia Perfringens* as a fairly reliable indicator of sewage contamination (see Appendix F.) DOH believes this is a significant development because it now makes water testing a much more reliable exercise. Whereas samples taken previously could determine when *Enterococcus* was **not** present, the reliability often failed when background sources were present. Since there was no means to distinguish between background and sewage-related sources, assessing health risks was difficult.

By analyzing samples for both *Enterococcus* and *Clostridia Perfringens*, DOH will now be able to identify situations when elevated levels of *Enterococcus* are present ***and*** the source of the bacteria is from a sewage-related source. Thus, the health risk assessment can be employed in the proper context under which it was intended to apply. False alarms due to non-sewage-related sources can virtually be eliminated. EPA's reluctance to accept *Clostridia Perfringens* as an additional indicator organism is understandable considering the lack of confirmatory studies, but at the same time it is unfortunate that this work is not recognized as a significant advancement when the

need for such a development is readily apparent and no other viable options appear available to monitoring personnel.

Instead of citing the inappropriateness of *Clostridia Perfringens* as an additional indicator organism, EPA should be attempting to clarify the conditions, if any, under which *Clostridia Perfringens* would be applicable, or not applicable. Such actions would be far more productive and constructive than to merely dismiss *Clostridia Perfringens.*

CHAPTER TWO

PLAN FOR ACHIEVING COMPREHENSIVE ASSESSMENT

CWB prepared the Hawaii Ambient Water Quality Monitoring Strategy in 1995. Despite the fact that this draft document was never finalized, CWB has attempted to follow this plan as much as practicable. However, because it was not finalized, there currently is no formal Section 106 Monitoring Strategy.

EPO has issued another draft document entitled, "Quality Management Plan for Surface Water Quality Monitoring" which revises the direction of the Monitoring Program. The document is included in Appendix G. It is currently being routed for comments.